

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: July 20, 1976

Project Title: *Increased Productivity and Quality Through Self Rewarding*

Project No: *M-50-617*

Project Director: *Dr. M. R. Blood*

Sponsor: *Office of Naval Research*

Agreement Period: From 6/1/76 Until 5/31/77

Type Agreement: *Contract No. N00014-76-C-0828*

Amount: *\$27,598 ONR*
16,364 GIT
\$43,962 Total

Reports Required: *Progress Reports, Final Report*

Sponsor Contact Person (s):

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Defense Priority Rating: *D0-C9*

Assigned to: *Industrial Management* (School/Laboratory)

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Project Code (GTRI)
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SPONSORED PROJECT TERMINATION SHEETDate 5/18/82

Project Title: Increased Productivity and Quality Through Self Rewarding

Project No: M-50-617

Project Director: Dr. M. R. Blood

Sponsor: Office of Naval Research

Effective Termination Date: 8/31/79

Clearance of Accounting Charges: _____

Grant/Contract Closeout Actions Remaining:

- ☐ Final Invoice and Closing Documents
- ☐ Final Fiscal Report
- ☐ Final Report of Inventions
- ☒ Govt. Property Inventory & Related Certificate
- ☐ Classified Material Certificate
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ONR Contract No. N00014-76-C-0828
Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
1st Quarterly Report
August 31, 1976

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - Activity on this project took place in three different arenas during this quarter. First, the project director and two research assistants continued work on the development of the measurement instruments that will be used in the survey portions of the project. Statistical analyses of previously collected data allowed refinements of the questionnaire items. Second, the project director participated in the NATO Conference on Coordination and Control of Group and Organizational Performance in Munich, Germany (see sections (c) and (d) below). Third, discussions were begun with a manufacturer of communication cables and with a manufacturer of energy production equipment to elicit cooperation in research. The former organization decided after several discussions that they could not participate in such a study. The latter organization is soliciting necessary approvals from within the organization.
- (c) Reports, journal articles, books - A slightly modified version of the presentation made at the NATO Conference (see (d) below) has been accepted for publication in an edited book of readings. This article sets forth the conceptual framework for this research project. It is referenced:
Blood, M. R. Organizational control of performance through self rewarding. In King, B. J., Streufert, S., and Fiedler, F. E. Managerial control and organizational democracy. New York: Halsted Press, in press.
- (d) Publicity, speeches, colloquia - The conceptual framework for the project was presented to the NATO Conference on Coordination and Control of Group and Organizational Performance in Munich, Germany.
- (e) Problems encountered - The withdrawal of the cable manufacturer as a potential research site requires initiation of discussions with other organizations.
- (f) Fiscal status - In the absence of suitable Ph.D. students for the research assistant position, the money for that position has been used to hire two Masters' level assistants who have appropriate training and interests.
- (g) Action required by ONR - none.
- (h) Future plans and milestones - Additional organizations will be contacted soon to insure timely administration of the survey instrument.

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Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
2nd Quarterly Report
November 30, 1976

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - Discussions continued in attempting to arrange a research site for the field survey. The energy equipment manufacturer has postponed any research until early 1977, since they have recently undergone a layoff of 300 persons and further layoffs are anticipated. Such turmoil would undoubtedly have undesirable influence on survey results. A container manufacturer has been approached, and they must seek approval at corporate levels. A working form of the questionnaire has been completed so that administration can take place soon after approval is given.

In an effort to clarify a methodological problem that this project must confront, a Monte Carlo study has begun. The theoretical foundation of the project includes several variables acting in the role of moderator variables. Since the research literature demonstrates questionable success in confirming moderators, an investigation of the moderated regression analysis procedure has been started. As an initial step 100 cases (each with $n = 100$) have been generated with each individual being assigned scores for an independent variable (I), a moderator variable (M), and a dependent variable (D). The first two variables (I and M) are uncorrelated, positive, random normal deviates; the dependent variable is formed as $D = (I \times M) + e$, where e is a random normal deviate with mean = 0. For each of the 100 cases, the traditional (and some nontraditional) regression analyses were completed. In these samples a moderator effect is guaranteed because of the way the dependent variable was generated. Nonetheless, the standard analysis technique does not provide evidence of a moderator! Further analyses are planned with these data, and other samples will be generated.

- (c) Reports, journal articles, books - none.
- (d) Publicity, speeches, colloquia - none.
- (e) Problems encountered - The survey administration has been further delayed.
- (f) Fiscal status - no problems.
- (g) Action required by ONR - none.
- (h) Future plans - Additional work will be done with the moderated regression analysis study. What began as a simple demonstration now shows promise of being an important methodological finding.

ONR Contract No. N00014-76-C-0828
 Research Project M-50-617
 Georgia Institute of Technology
 M. R. Blood, Project Director
3rd Quarterly Report
 February 28, 1977

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - The energy industry materials manufacturer with whom we were about to collect data has asked for a delay until after July 1977. The energy crisis of the winter caused work problems that forbid any data collection at this time. Meanwhile two research samples have been secured. One is a sample of dental students in a large university, and the other is a group of managers in a large manufacturing firm. In both cases the questionnaires will be returned by mail so there is some concern for sampling adequacy. Other negotiations for a sample are ongoing with a large department store chain.

The moderated regression analysis study has gone forward with the generation of additional samples. In these samples various parameters have been shifted to test the effects on the results. For each of the five conditions that will be further analyzed, 20 cases (each with $n = 100$) were generated. They differ from the previously generated cases by the following characteristics:

- Condition I - increased error
 $D = (I \times M) + 5e$
- Condition II - correlated independent variable and moderator
 $D = (I \times M) + e$
- Condition III - only independent variable effect
 $D = I + e$
- Condition IV - independent variable effect and moderation effect
 $D = I + (I \times M) + e$
- Condition V - linear effects, but no moderation effect
 $D = I + M + e$

Secondary analyses have begun, i.e., the results of the analyses are themselves being analyzed. Conditions I, II, and III do not change the basic result that the traditional analysis leads to type II error. This finding will have significance for the field of industrial/organizational psychology and for people in other social science areas who use the moderator variable concept. Secondary analyses have not been completed for Conditions IV and V. A technical report has been started that will present these results.

- (c) Reports, journal articles, books - none.
- (d) Publicity, speeches, colloquia - Results from the moderated regression analysis study were the topic of a presentation by the project director to a faculty seminar of the College of Industrial Management, Georgia Institute of Technology.

3rd Quarterly Report
Page Two

- (e) Problems encountered - There is a continuing problem of acquiring a field research site for the questionnaire survey. Though two sites are now secured, the mail return aspect of them makes additional sites desirable.
- (f) Fiscal status - no problems.
- (g) Action required by ONR - none.
- (h) Future plans - no changes.

ONR Contract No. N00014-76-C-0828
Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
4th Quarterly Report
May 31, 1977

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - The investigation of the characteristics of the traditional moderated regression analysis has been completed. Secondary analyses overwhelmingly confirmed the hypotheses of the study, i.e., traditional moderated regression analysis virtually guarantees Type II error. Suggestions have been made for preferable analytic procedures.

Data have been collected from a dental student population for the survey portion of the study. These data have been processed, and analyses are beginning. Data are expected soon from a sample of industrial managers. Other sites are being solicited.

An experimental task has been designed and the research manipulations are currently being devised for the experimental portions of the study that will be carried out in year two. Pilot data will be collected using this task in the next quarter.

- (c) Reports, journal articles, books -
Blood, M. R., and Mullet, G. M. Where have all the moderators gone:
The perils of Type II error. Technical Report no. 1, May, 1977.
- (d) Publicity, speeches, colloquia - The moderated regression analysis study was the topic of a colloquium presented to the faculty of the Measurement and Individual Differences Program, University of Georgia, Athens, Georgia.
- (e) Problems encountered - none.
- (f) Fiscal status - Continuation budget has been submitted and is being processed.
- (g) Action required by ONR - none.
- (h) Future plans - The only change from the original proposal is that concurrent with the planned activities for the second year of the project, the survey studies of the first year will be continued. This is desirable because of the delays encountered in arranging field research sites.

ONR Contract No. N00014-76-C-0828
Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
1st Quarterly Report, Second Year
August 31, 1977

#5

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - Data analyses have been done for the survey data that were collected from a sample of dental students. Though the analyses are still being interpreted, initial examination shows a substantial support for the underlying theory of this research project. A technical report will be developed from these data.

Disruptions in organizational schedules due to summer vacations have interrupted attempts to engage further sites for survey data collection, but several leads are being followed.

Materials and equipment have been devised for the experimental portions of the second year studies. Pilot subjects have been run using the experimental task, and some minor revisions are being made in the materials according to needs indentified in the pilot runs.

- (c) Reports, journal articles, books - none.
- (d) Publicity, speeches, colloquia - none.
- (e) Problems encountered - none.
- (f) Fiscal status - The continuation budget has been received, and there have been no necessary deviations from it.
- (g) Action required by ONR - none.
- (h) Future plans - Parallel field and experimental studies will be carried out as mentioned in previous quarterly reports.

ONR Contract No. N00014-76-C-0828
Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
Second Quarter Report, Second Year
November 30, 1977

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - Contacts have been made for a field site for the research project. A major carpet manufacturer would like to begin a program in three plants that will incorporate the questionnaire survey part of this research project and some of the "hands-on" interventions envisioned for the third year of this project. After considerable negotiation about the need of this project to generate appropriate research data and the need of the organization to retain control of its production operations, a cooperative relationship has been established. We now expect to collect questionnaire data to test the self rewarding model at three different times in each plant. Some interventions designed to improve self rewarding and productivity will be introduced in two of the plants between survey 1 and survey 2 and in the third plant between survey 2 and survey 3. This will constitute a modified multiple-baseline research design for analysis purposes. Objective performance data will be collected continuously throughout the time of this collaboration. The organization has been extremely cooperative in making the research sites available and in providing coordination for the conduct of the surveys and the performance data. The first wave of survey data have been collected in all three locations, and the performance data are being collected. The survey data are being processed now to put them in order for computer analysis.

The experimental laboratory study of self rewarding has begun. The first subjects are being run and the initial data demonstrate strong support for the changes predicted by the theory.

- (c) Reports, journal articles, books - none.
- (d) Publicity, speeches, colloquia - The self rewarding model and the initial data were presented to the meetings of the Society for Organizational Behavior at Purdue University in October.
- (e) Problems encountered - none.
- (f) Fiscal status - No problems.
- (g) Action required by ONR - none.
- (h) Future plans - Both field study and experimental studies are being conducted currently. Because of the availability of a cooperating organization that will provide field sites, the calendar for this research program has been pushed forward more quickly than originally anticipated. We are now able to begin some activities previously envisioned for the third year of the project, even though we are only in the second half of the second year.

ONR Contract No. N00014-76-C-0828
Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
Third Quarterly Report, Second Year
February 28, 1978

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - Data analyses have been conducted for the survey data that were collected in the first wave of questionnaire administrations in the three carpet mills. Because these data are quite extensive, the analyses are still on-going. It is expected that they will suggest some modifications in the original self rewarding model, but is is too early to determine just what modifications will be necessary. Comparison of these data with the earlier survey data from the dental school sample demonstrates a strong similarity in the patterns of relationships among the variables of the model.

As a part of the intervention strategy to attempt to increase the amount of self rewarding in the organization, we are developing a management training program to help to define for workers what constitutes good performance. This program will be introduced in the various carpet mills at the times called for in the multiple baseline research design. By monitoring the performance data provided by the organization and the cognitive information provided by our survey instruments, we will be able to determine the influence of this training program and other interventions we have made in the carpet mills.

The experimental studies are continuing. More subjects have been run, and the data continue to confirm the self rewarding model.

The technical report from the dental school survey administration is nearly completed, and writing has begun on the technical report concerning the data from the carpet mills.

- (c) Reports, journal articles, books - none.
- (d) Publicity, speeches, colloquia - none.
- (e) Problems encountered - none.
- (f) Fiscal status - No problems.
- (g) Action required by ONR - none.
- (h) Future plans - Both the experimental and field studies are continuing. The second wave of survey data will be collected in the carpet mills during March and April. The interventions in the third carpet mill will be put into place after the second survey administration. Current plans call for the third survey administration in the carpet mills in the early part of the summer of 1978. Cooperation with the carpet manufacturer remains quite good, and it is likely that they will provide additional research site for continuation studies if requested.

ONR Contract No. N00014-76-C-0828
Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
Fourth Quarterly Report, Second Year
May 31, 1978

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - As a part of the intervention strategy to increase the amount of self rewarding in the organization, a management training program was developed to train supervisors to provide positive feedback for correct performance. This training program was introduced in all three of the carpet mills. It constitutes a major part of the intervention. It is meant to increase the amount of goal recognition. Performance data are being monitored to detect the influence of the training program.

Near the end of this quarter the second wave of survey measurements was completed. These data will be processed and analyzed as the second stage of the multiple baseline research design.

Data collection from the first round of the experimental study has been completed. Those data are now undergoing analysis. A technical report has been begun.

The technical report of the data from the dental school survey has been completed and distributed.

- (c) Reports, journal articles, books -
Blood, M. R. Self Rewarding and Task Performance: Internal and External Criteria. Technical Report No. 2, May, 1978.
- (d) Publicity, speeches, colloquia - none.
- (e) Problems encountered - none.
- (f) Fiscal status - A projected budget for third year funding has been proposed.
- (g) Action required by ONR - none.
- (h) Future plans - The field studies are continuing. Preliminary analyses of the second wave of survey data in the carpet mills indicate a failure of the manipulation. Therefore, no tests of the model has been afforded. The third wave of survey information will not be collected until the manipulation has been strengthened.

ONR Contract No. N00014-76-C-0828
Research Project M-50-617
Georgia Institute of Technology
M. R. Blood, Project Director
First Quarterly Report, Third Year
August 31, 1978

- (a) Project Title - Increased Productivity and Quality through Self Rewarding
- (b) Accomplishments during the quarter - Data analyses have been conducted for the survey data from the second wave of questionnaires in the three carpet mills. The analyses confirm that the manipulation was not sufficiently strong between the first and second administrations. Analyses of the static data from both the first and second administrations has confirmed the self rewarding model. The longitudinal demonstration of the efficacy of the model is not possible because of the failure of the manipulation. The static results remain extremely similar both over plants and over time.

A technical report that presents the results thus far in the carpet mills has been prepared. Writing continues on the technical report from experimental studies.

- (c) Reports, journal articles, books -
Thoene, Th. J. F., and Blood, M. R. Self Rewarding as an Influence on Industrial Performance. Technical Report No. 3, July, 1978.
- (d) Publicity, speeches, colloquia -
Blood, M. R. The Role of Self Rewarding in Work Motivation. Paper presented at the 19th Congress of the International Association of Applied Psychology, Munich, August, 1978.
- (e) Problems encountered - Labor relations disputes and personnel changes in the host organization have postponed the third wave of data collections from the carpet mills. The administration of the carpet mills appears to remain cooperative, and after some delay the research project is expected to continue.
- (f) Fiscal status - Operation on the third year budget has begun.
- (g) Action required by ONR - none.
- (h) Future plans - The most pressing need is to insure that the manipulation is still operating in the third carpet mill and then to conduct the third wave of questionnaire administration. Tentative contacts have been made with two other organizations that may potentially provide research data.

M-50-617

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This is the Final Report of a research project conducted between June 1, 1976 and August 31, 1979. The project dealt with the conceptual development and empirical testing of the concept of self rewarding in work motivation.		

INCREASED WORK PRODUCTIVITY AND QUALITY THROUGH SELF REWARDING

Georgia Institute of Technology/Blood

Work on this project was conducted between June 1, 1976 and August 31, 1979. The project involved the conceptual development and the initial empirical investigations of the concept of self rewarding for work performance.

A methodological investigation was conducted as a preliminary step in the research program (Technical Report #1). Since the conceptual framework for Self-Rewarding required the study of moderator variables, a project was undertaken to investigate a shortcoming of traditional moderated regression analysis. A Monte Carlo process generated samples of data with known characteristics. The application of standard analyses demonstrated how interpretation errors are possible (and likely) with moderated regression analysis. This report emphasized the importance of theory as a guide to analysis, and it suggested an alternative approach.

The conceptual basis for the program of study was presented in two publications (Blood, 1978, 1981). This theoretical framework combines and coordinates the literature from several other programs of study. Self Rewarding incorporates the concepts of job design, goal setting, knowledge of results, and cognitive behavior modification. These various concepts are coordinated in the process of the cognitive response of a person to his/her own work performance.

Empirical studies (Blood & Olin, 1979; Technical Reports #2 & 3) began the study of the phenomena that were suggested in the conceptual analyses. They studied various aspects of the model in a lab setting, in a student population, and among factory workers. Some modifications in the original model were suggested.

The major research implication from these initial empirical attempts is that standard questionnaire survey methods are relatively weak instruments for studying such an idiosyncratic cognitive process as Self Rewarding. More intensive

methods are currently being tried.

The major applied implication from the studies is support for the importance of Self Rewarding. Within the limitations of the methods the concept was recognized as an influence on job performance. Organizations can use the model to encourage, rather than inhibit, Self Rewarding.

INDEX OF TECHNICAL REPORTS

Blood, M. R. and Mullet, G. M. Where have all the moderators gone? The perils of Type II error. Technical Report no. 1.

Blood, M. R. Self rewarding and task performance: Internal and external criteria. Technical Report no. 2.

Thoene, T. J. F. and Blood, M. R. Self rewarding as an influence on industrial performance. Technical Report no. 3.

INDEX OF PUBLICATIONS

- Blood, M. R. Organizational control of performance through self rewarding. In King, B. T., Streufert, S., and Fiedler, F. E. Managerial control and organizational democracy. Washington, D. C.: V. H. Winston & Sons, 1978.
- Blood, M. R. and Olin, L. F. Self reward and job performance: An experimental study. Academic Psychology Bulletin, 1979, 1, 143-149.
- Blood, M. R. Internal motivation and organizational behavior. In J. A. Sgro, (Ed.), Virginia Tech Symposium on Applied Behavioral Science. Lexington, Mass.: D. C. Heath, 1981, 147-167.